

LA-ICP-MS STUDY of TRACE ELEMENTS in the CHANUSKIJ METAL

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Principal Investigator

Dr. Michail I. Petaev

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National Aeronautics and Space Administration  
Goddard Space Flight Center, Greenbelt, MD

Smithsonian Institution  
Astrophysical Observatory  
Cambridge, Massachusetts 02138

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This progress report covers work done during the second year of the 3-year proposal. During this year we resolved many issues relevant to the analytical technique developed by us for measuring trace elements in meteoritic metals (Petaev and Jacobsen, 2004). This technique was used to measure concentrations of Fe, Ni, Co, Cr, Cu, Ga, Ge, As, Mo, Ru, Rh, Pd, Sb, W, Re, Os, Ir, Pt, and Au in eight large (120 – 160 microns) metal grains from both ‘igneous’ and ‘metamorphic’ lithologies of the Chaunskij silicate inclusions. The first application of our technique to metal grains from thin sections showed some limitations. Small thickness of metal grains in the thin section limited the signal to 3-4 time-slices instead of 10-11 ones in polished

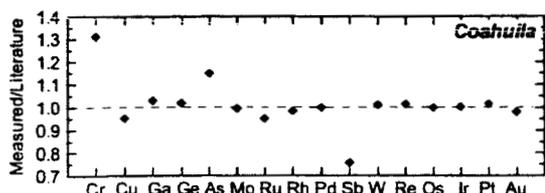


Fig. 1. Measured vs. literature data for the Coahuila drift monitor.

sections of iron meteorites studied before. However, even such a small number of time-slices seem to give good results, with the differences between the measured and literature data for the Coahuila drift monitor (Fig. 1) being still within 5 % for elements except for Cr (31 %), As (15 %), and Sb (24 %). The large deviations of the latter two elements are most likely due to the lack of analytical data in the Filomena and Hoba

standards, for which the average group data were used. The ICP-MS measurements of trace element concentrations in solutions of these meteorites are underway.

Our new data (Petaev and Jacobsen, 2005) clearly show that the composition of metal grains from the Chaunskij silicate inclusions is different from those of both the Chaunskij host metal and mesosideritic metal nodules. This points not only to the existence of at least two different types of mesosideritic metals, but also to the necessity of mixing two different types of metal on the parent body of the Chaunskij meteorite.

**Future analytical work** includes measurements of the same suite of major and trace elements in the Chaunskij host metal as well as in the metal nodules of other mesosiderites. This work is already in progress; the results will be reported as a poster at LPSC 36 along with data on individual metal grains from Chaunskij. Because of chemical similarities between the host metals of the Chaunskij and RKPA 79015 mesosiderites (Wasson et al., 1998) it seems important to analyze individual metal grains from the RKPA 79015 silicate inclusions. I plan to do it next year along with the analyses of the host metal. In order to test an assumption that mesosideritic metals might have derived from an H-chondrite-type metal (Hassanzadeh et al. 1990) I will also analyze metal from both individual grains and shock-produced veins of the H6 chondrite Portales Valley. I plan analyze troilite from both nodules and veins of Chaunskij. There are still some standardization issues which have to be resolved. If successful, I will perform similar analyses of troilite from other mesosiderites. One important issue which I did not touch upon yet is the composition of small Ni-poor metal grains which reside mainly in the igneous lithology. The grains are too small to be analyzed for the whole suite of trace elements using the current instrumentation. Recently we have obtained new Isoprobe-P instrument which has very high sensitivity. The instrument is now in the final stages of testing, but it is booked for the next few months. Later in 2005 I hope to interface it to the laser ablation system in order to test its applicability to LA-ICP-MS studies of iron meteorites on a spatial scale of ~5-10 microns. If successful, I will use it in studies of small metal grains from Chaunskij inclusions. Alternatively, I may use the Platform XS instrument and limit myself to a few critical chemical elements with relatively large concentrations such as Pd, Mo, Ge, As, Au, etc.

Interpretation of data is already underway. During the last year I plan to submit a major paper on chemistry of metal from Chaurskij and other mesosiderites.

Relevant publications:

Petaev M. I. and Jacobsen S. B. (2004) Differentiation of metal-rich meteoritic parent bodies. I. Measurements of PGEs, Re, Mo, W, and Au in meteoritic Fe-Ni metal. *Meteorit. Planet. Sci.* 39, 1685-1697

Petaev M. I. and Jacobsen S. B. (2005) LA-ICP-MS study of trace elements in the Chaurskij metal. *Lunar Planet. Sci.* 36, Abstract # 1740.